NIST Databases and Resources: Hidden Gems

Regina Avila, Kate Bucher, and Susan Makar

2019 Federal Depository Library Conference

October 21, 2019

National Institute of Standards and Technology
U.S. Department of Commerce

ISO INFORMATION SERVICES OFFICE

Presentation Outline

- Introduction to NIST
- Information Services Office (aka the NIST Research Library)
- Popular NIST databases
  - NIST Chemistry WebBook
  - NIST Digital Library of Mathematical Functions (DLMF)
  - NIST on GitHub
  - World Trade Center Investigation
  - National Software Reference Library (NSRL)
  - NIST Science Data Portal
  - NIST Digital Archives (NDA)
  - NIST Publications in govinfo

National Institute of Standards and Technology (NIST)

- Non-regulatory federal agency made up of about 3,000 science and technology researchers
- NIST promotes U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology
- Home of five Nobel Laureates
- Home of the atomic clock
- Gaithersburg/Boulder campuses

Credit: Copyright Robert Rathe

Information Services Office

- Supports and enhances the research activities of the NIST scientific community
- Also known as the NIST Research Library
- Staff of 20, plus contractors
- Teams
  - Museum & Archives
  - Outreach & Marketing
  - Resources, Access, Data

Credit: Stoughton/NIST

Highly Used NIST Data and Information

- Atomic Spectra Database
- Ballistics Toolmark
- Chemistry WebBook
- Digital Library of Mathematical Functions
- Fire Research
- Materials Genome Initiative
- National Vulnerability Database
- NIST GitHub Repository
- Physical Reference Data
- Standard Reference Data (SRDs)
- Time
- World Trade Center Disaster Investigation Material

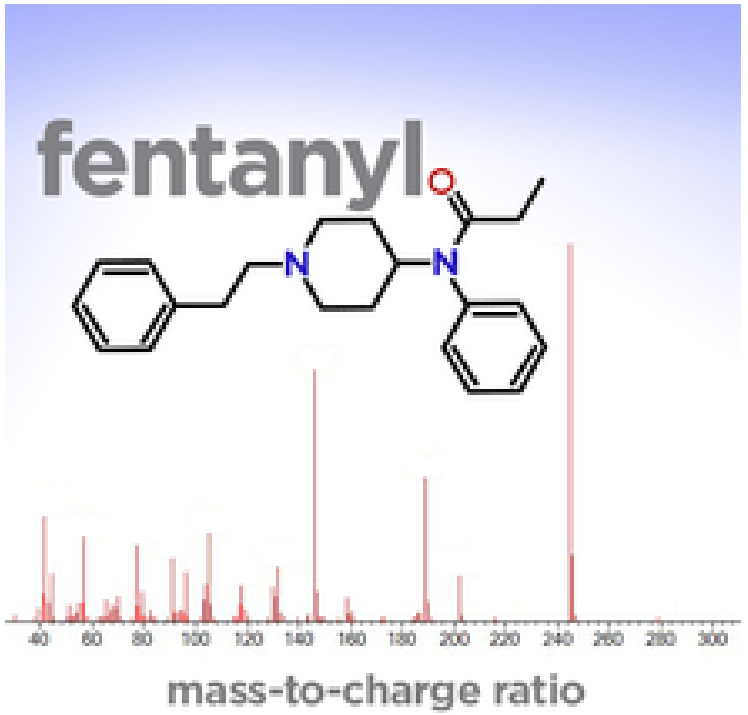
NIST Chemistry WebBook

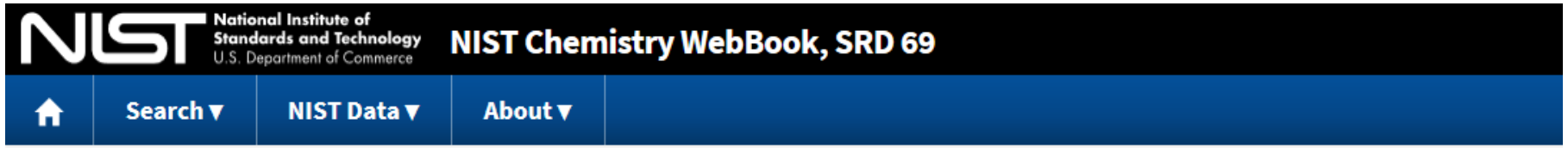
- Provides access to data compiled and distributed by NIST under the Standard Reference Data Program.

- Contains:
  - Thermochemical data for over 7000 organic and small inorganic compounds
  - IR spectra for over 16,000 compounds
  - Mass spectra for over 33,000 compounds
  - UV/Vis spectra for over 1600 compounds
  - Gas chromatography data for over 27,000 compounds
  - Electronic and vibrational spectra for over 5000 compounds
  - Constants of diatomic molecules (spectroscopic data) for over 600 compounds
  - Ion energetics data for over 16,000 compounds
  - Thermophysical property data for 74 fluids

NIST Chemistry WebBook

- Search options
  - Name
  - Formula
  - IUPAC Identifier
  - CAS Registry Number
  - Other options
    - Reaction
    - Author
    - Structure





NIST Chemistry WebBook

NIST Standard Reference Database Number 69

Last update to data: 2018 DOI: https://doi.org/10.18434/T4D303

View: Search Options, Models and Tools, Special Data Collections, Documentation, Changes, Notes

▷Credits

NIST reserves the right to charge for access to this database in the future.

Search Options

General Searches

- Formula
- Name
- IUPAC identifier

Physical Property Based Searches

- Ion energetics properties
- Vibrational and electronic energies
- Molecular weight

https://webbook.nist.gov/chemistry/

NIST Digital Library of Mathematical Functions

- Online project at NIST to develop a major resource of mathematical reference data for special functions and their applications
- Complete revision of Abramowitz's and Stegun's *Handbook of Mathematical Functions* (AMS 55)
- Published online in 2010

Digital Library of Mathematical Functions

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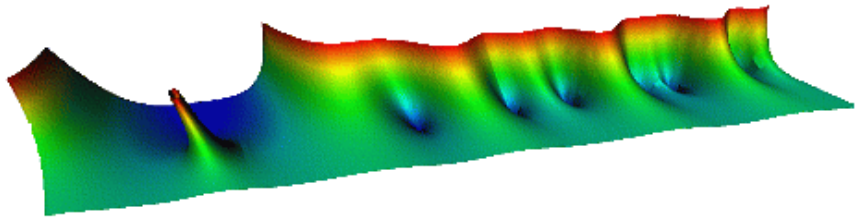
About the Project

NIST
National Institute of Standards and Technology
U.S. Department of Commerce



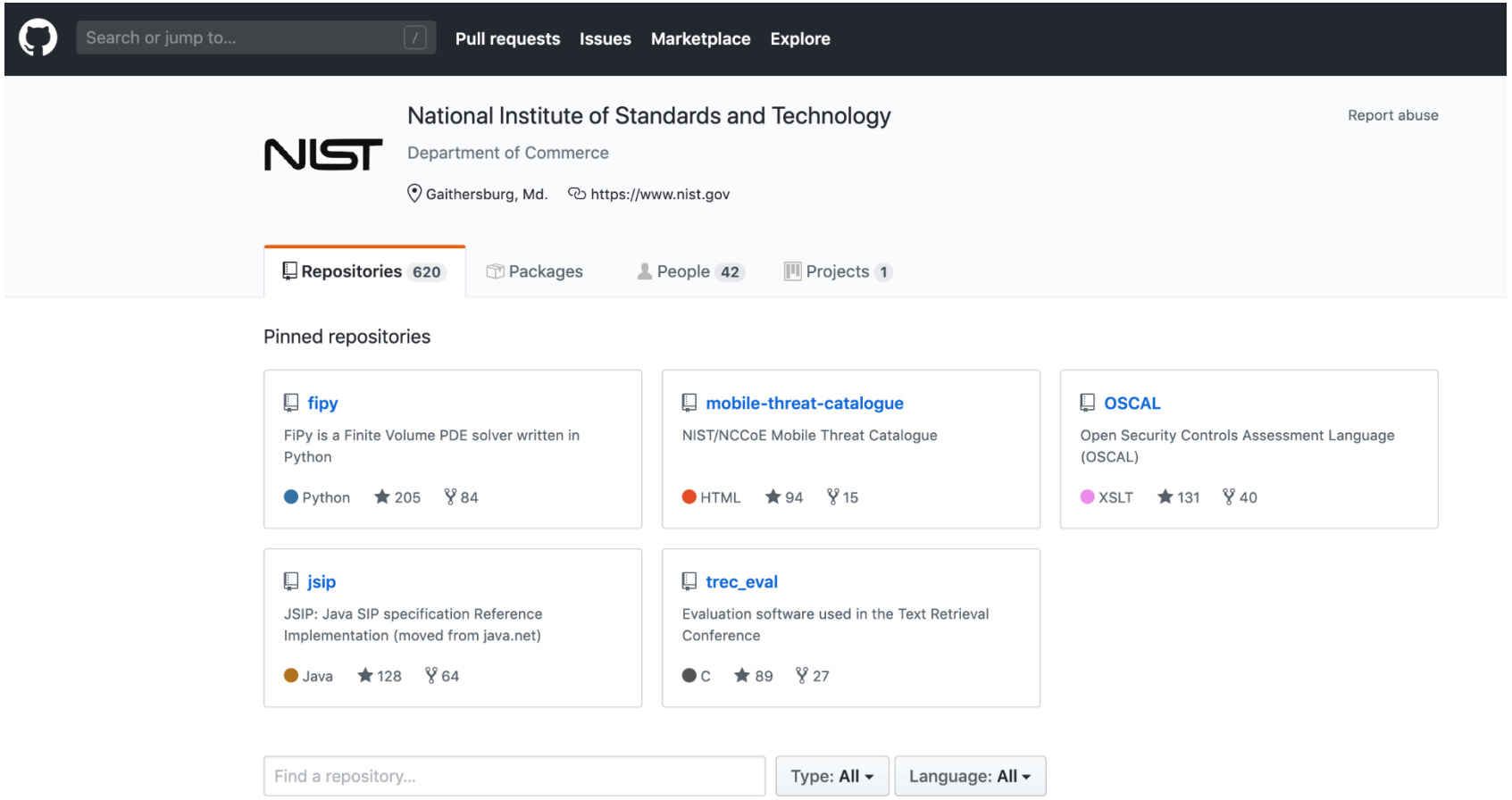
NIST Digital Library of Mathematical Functions

Project News

2019-09-15 *DLMF Update; Version 1.0.24*
2019-06-15 *DLMF Update; Version 1.0.23*
2019-03-15 *DLMF Update; Version 1.0.22*
2018-12-15 *DLMF Update; Version 1.0.21*
More news

https://dlmf.nist.gov/

NIST on GitHub



https://github.com/usnistgov

World Trade Center Investigation

NIST

Search NIST

NIST MENU

Resilience

DISASTER & FAILURE STUDIES

- About the Disaster and Failure Studies Program
- Recent Activities
- Disaster & Failure Studies Data Repository +
- FAQs and Presentations
- Hurricane Maria
- National Construction Safety Team (NCST) +
- Studies by Hazard Types +
- Impacts and Recommendations
- World Trade Center Disaster Study −
  - About the Investigation
  - Study FAQs
  - Investigation Meetings and

WTC Disaster Study

On August 21, 2002, with funding from the U.S. Congress through FEMA, the National Institute of Standards and Technology (NIST) announced its building and fire safety investigation of the World Trade Center (WTC) disaster that occurred on September 11, 2001. The NIST WTC Investigation was conducted under the authority of the National Construction Safety Team Act.

WTC Fire Experiment #6 showing room completely enveloped in flames and showing failure of two glass panels on left.

The goals of the investigation of the WTC disaster were :

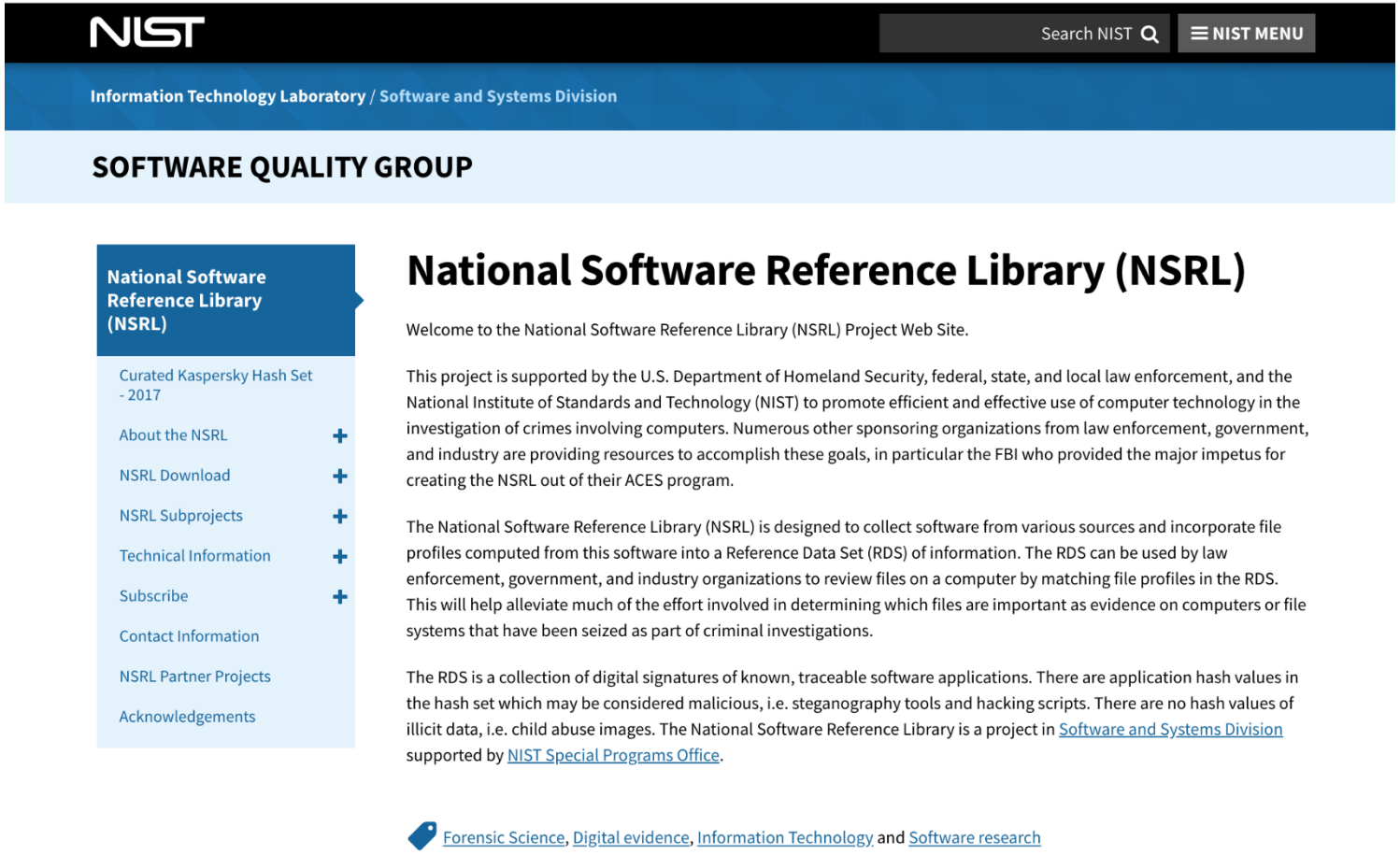
- To investigate the building construction, the materials used, and the technical conditions that contributed to the outcome of the WTC disaster.
- To serve as the basis for: improvements in the way buildings are designed, constructed, maintained, and used; improved tools and guidance for industry and safety officials; recommended revisions to current codes, standards, and practices; and improved public safety.

The specific objectives were:

- Determine why and how WTC 1 and WTC 2 collapsed following the initial impacts of the aircraft and why and how WTC 7 collapsed;

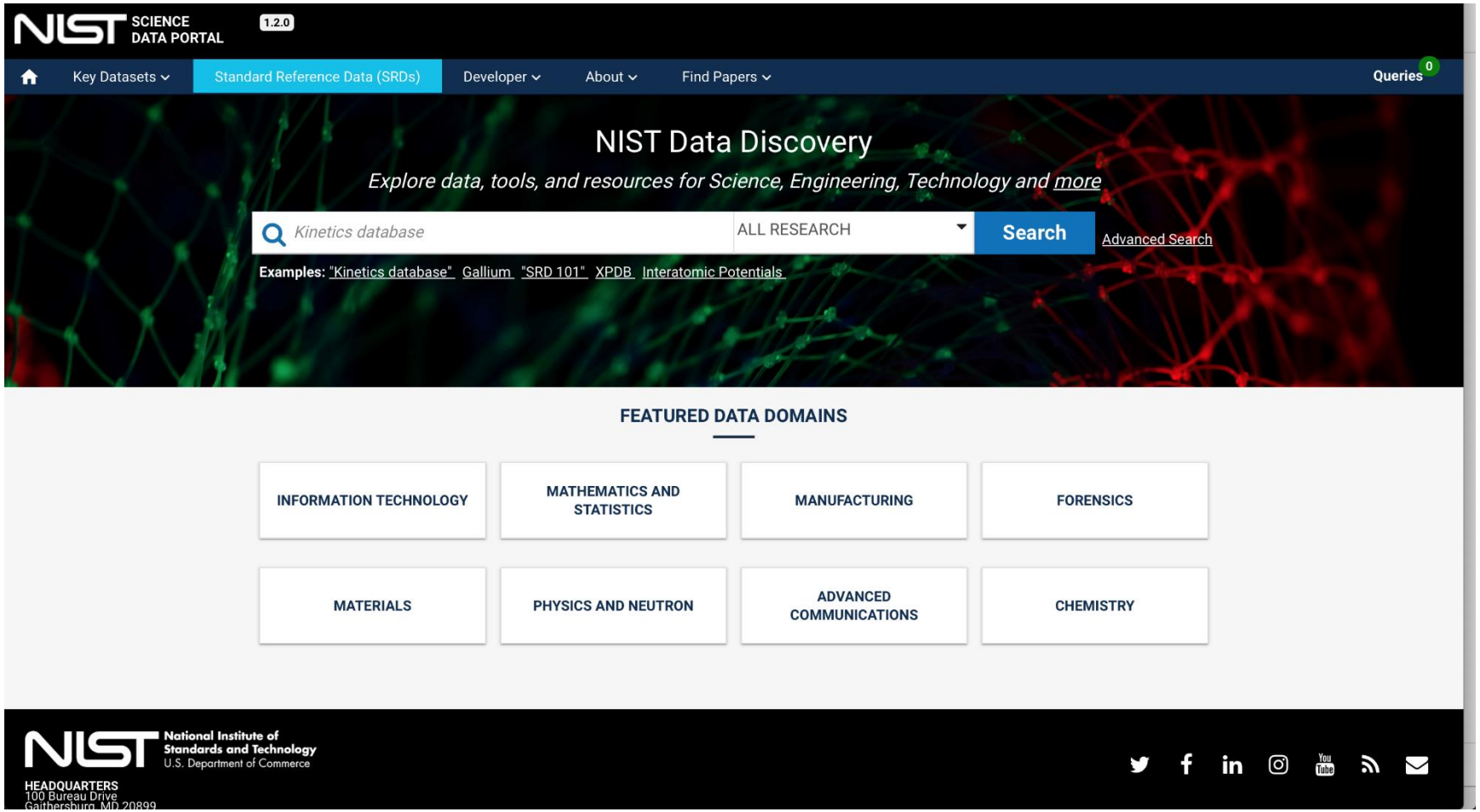
https://www.nist.gov/topics/disaster-failure-studies/world-trade-center-disaster-study

National Software Reference Library



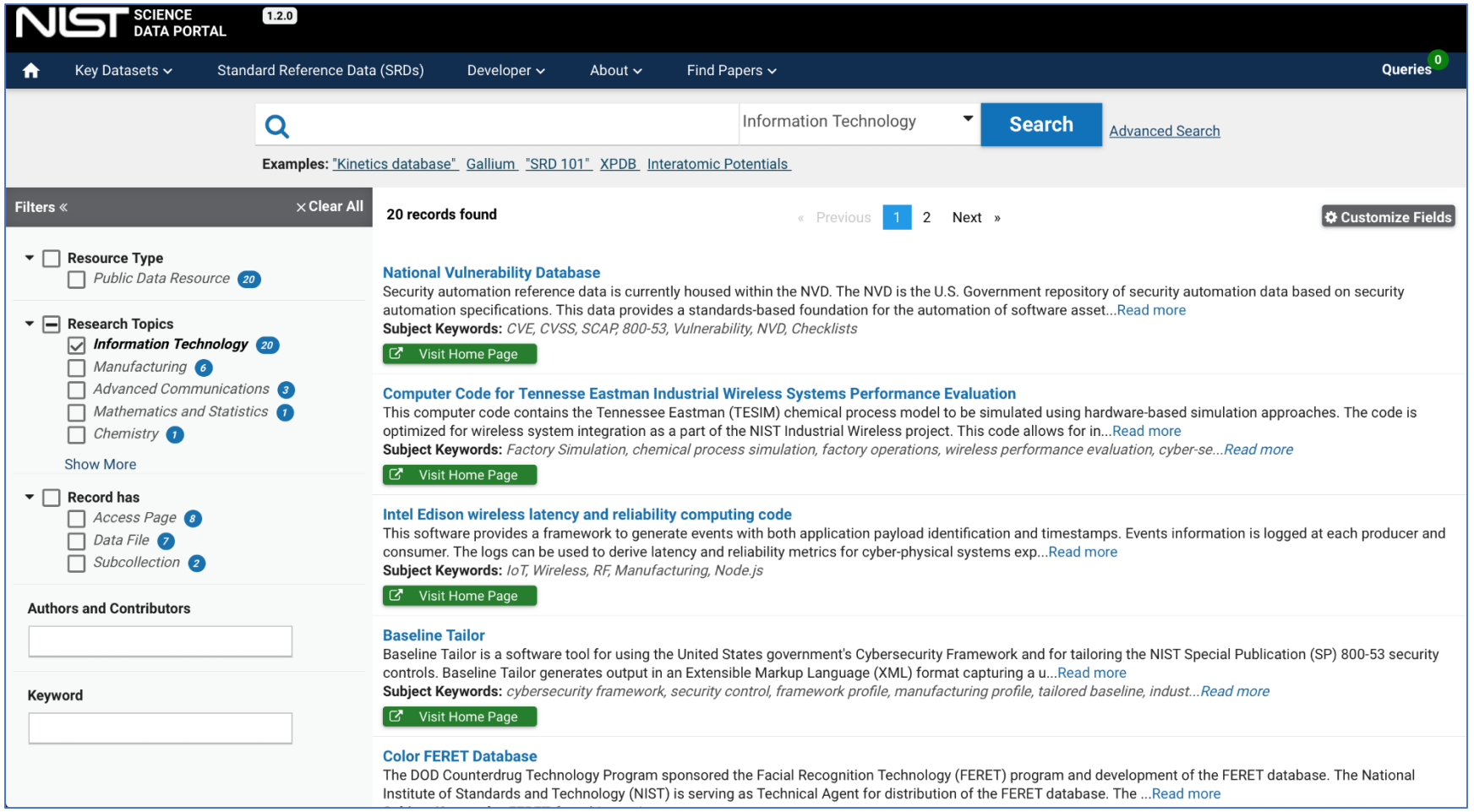
https://www.nist.gov/software-quality-group/national-software-reference-library-nsrl

NIST Science Data Portal



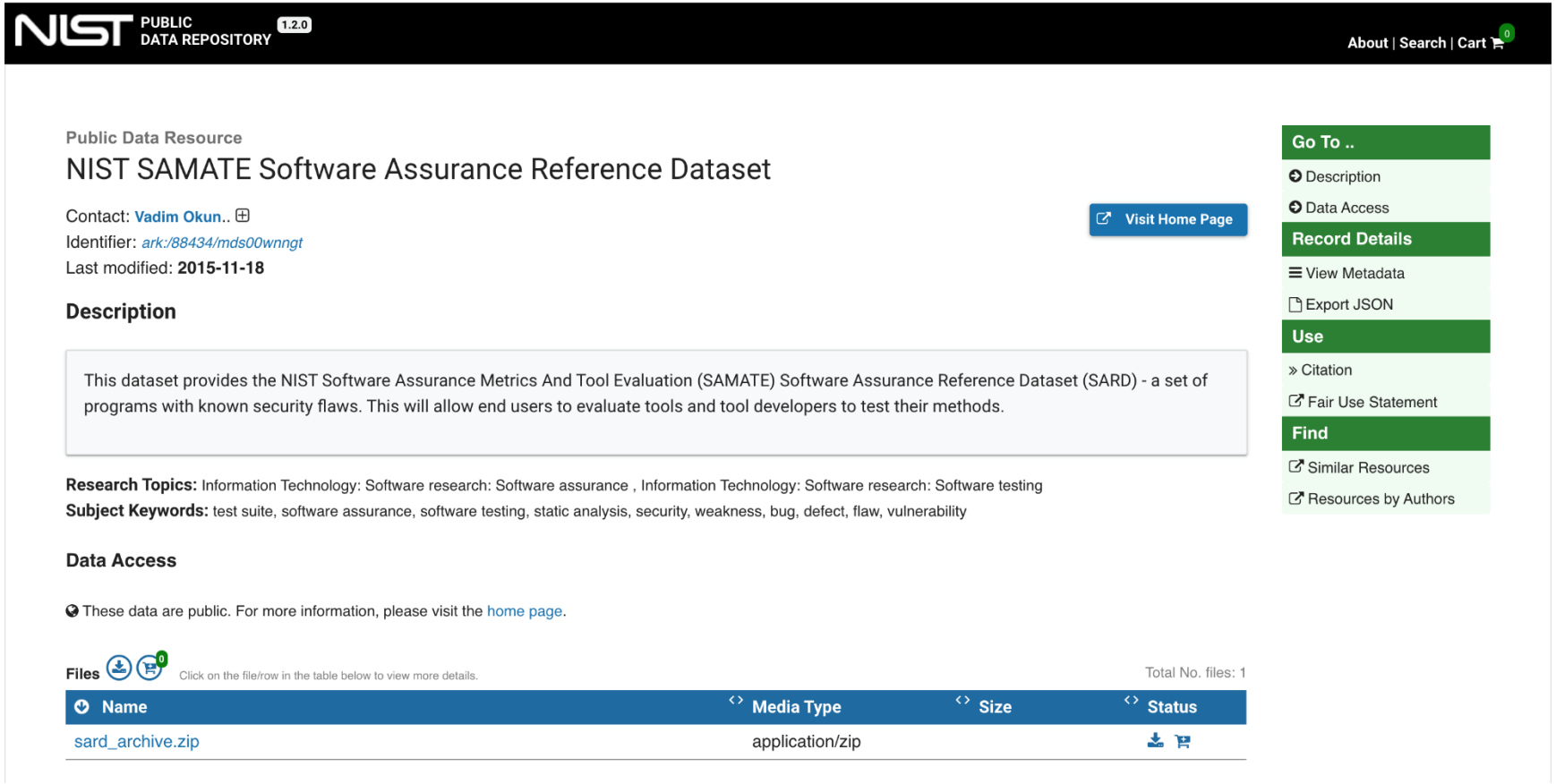
https://data.nist.gov/sdp/

NIST Science Data Portal



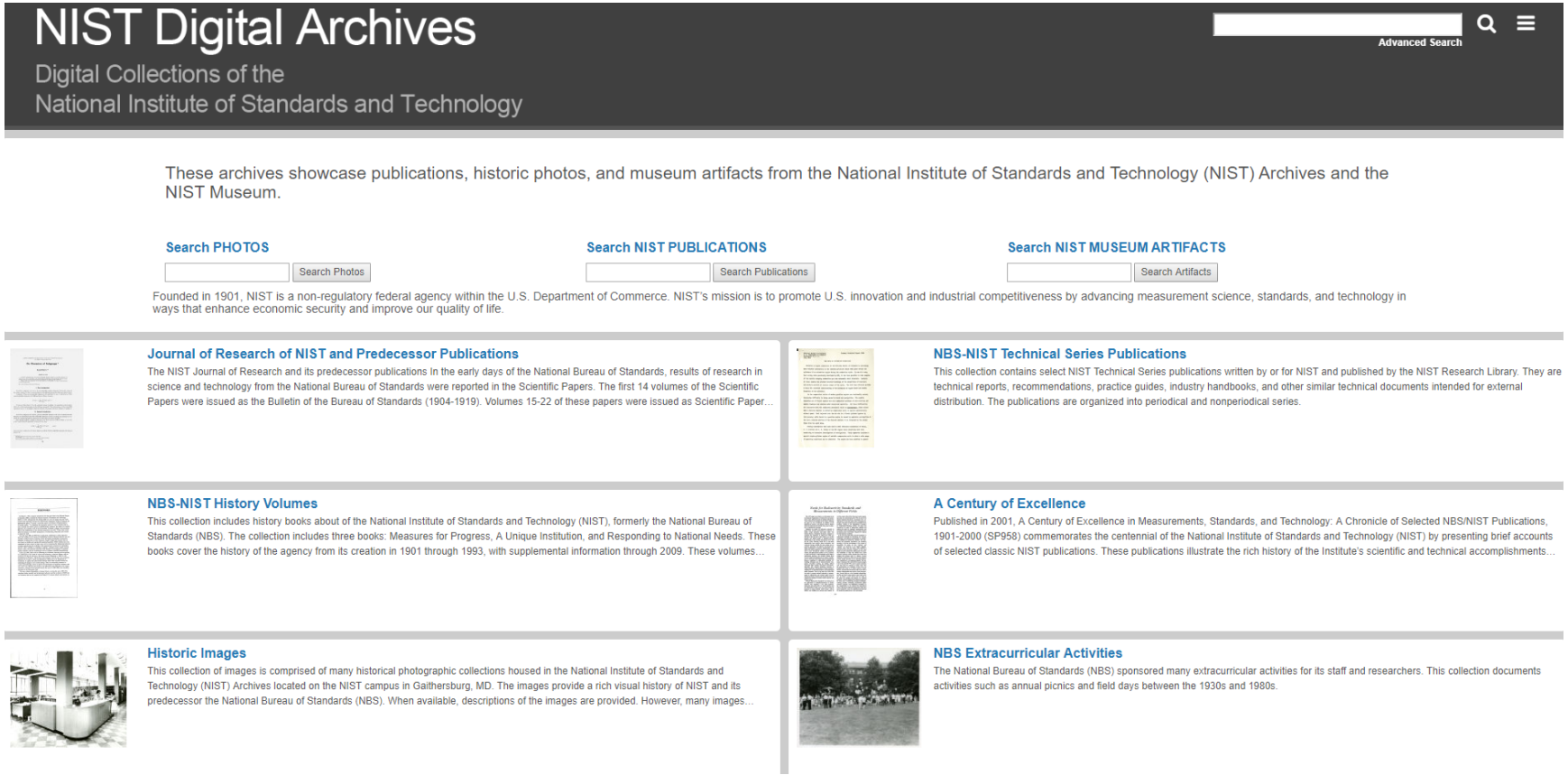
https://data.nist.gov/sdp/

NIST Science Data Portal



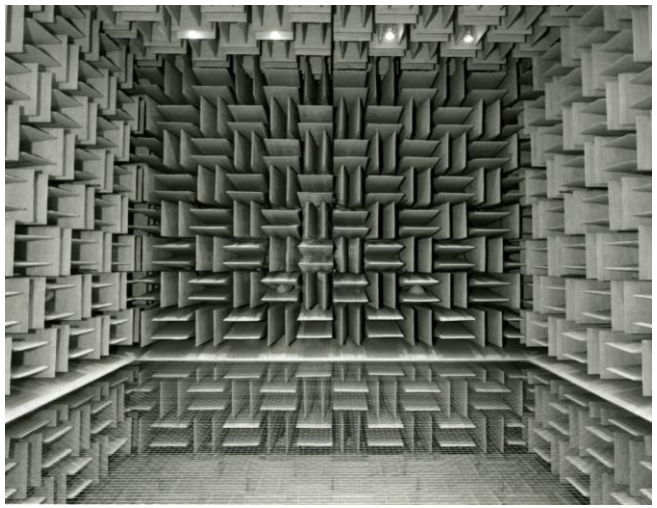
https://data.nist.gov/sdp/

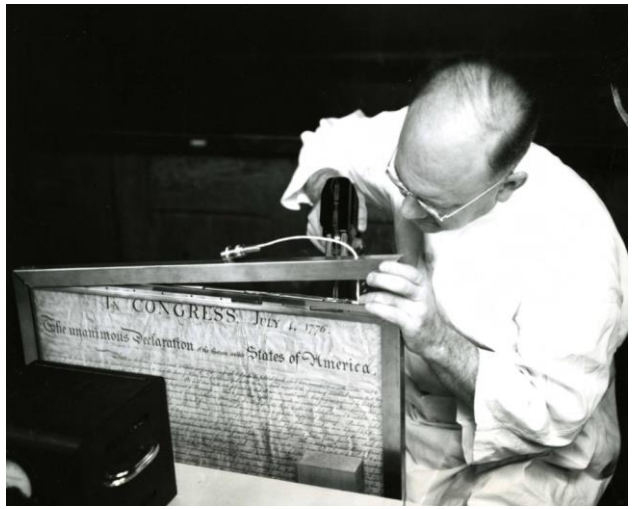
NIST Digital Archives (NDA)



https://www.nist.gov/digitalarchives

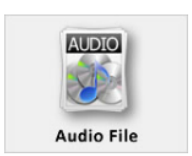
NIST Historic Photographs





https://www.nist.gov/digitalarchives

NIST Oral Histories



Fire Research Program at NBS

Oral history interview of Fire Research Program at NBS, August 3, 1988 / interviewees includ
Karma Beal
Alexander Robertson, Harry Shoub, Daniel Gross, E. Carroll Creitz, Marjorie Sandholzer, Willi
participanted in -- burnout studies, resistance of concretes to jet engine exhaust, Air Force pro
1988-08-03

Fox, Margaret

Oral History Interview of Margaret Fox on April 13, 1983 / with James Ross

Miss Margaret Fox discusses her work in the computer group at NBS during the 1950s. She t
First Computer Conference in Philadelphia in 1951 and the first international conference in Pa
1983-04-13

Gadzuk, J. William

Oral history interview of J. William (Bill) Gadzuk, January 27, 2015/ [persons present]: Cedric

Oral history interview of J. William (Bill) Gadzuk, conducted on Tuesday, January 27, 2015 at
Bureau of Standards, for 45 years, first doing research in surface science, surface physics an
2015-01-27

Gary, Thomas

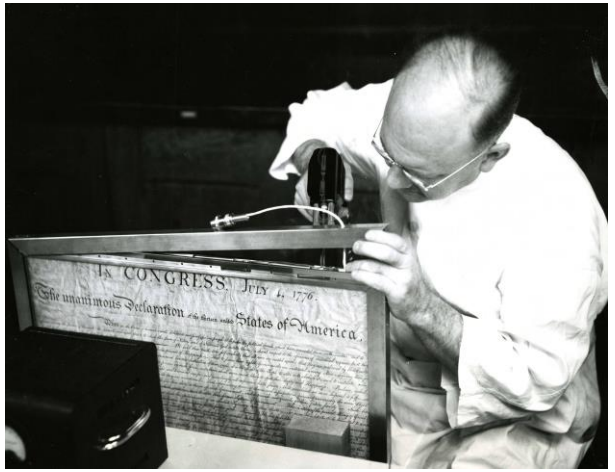
Oral history interview of Thomas Gary, November 4, 2005 / with David Lide, Hans Oser, Harri

Oral history interview of Thomas Gary, November 4, 2005. Thomas Gary came to the Nationa
of the Metallurgy Division. He discusses the jobs he had at the National Institute of Standards
2005-11-04

Gebbie, Katharine

Oral history interview of Katharine Gebbie, May 12, 1987 / by Karma Beal

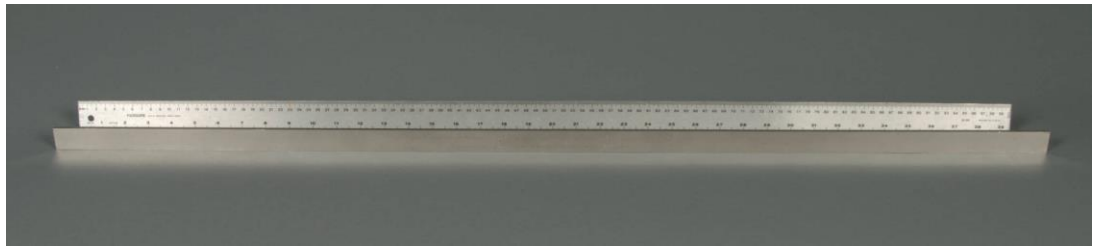
Katharine Gebbie discusses the JILA Program (a joint institute between NBS and the Universi
working environment of JILA - the NBS components, the University personnel, the grad stude
1987-05-12



https://www.nist.gov/digitalarchives

NIST Museum Artifacts

Riefler Clock



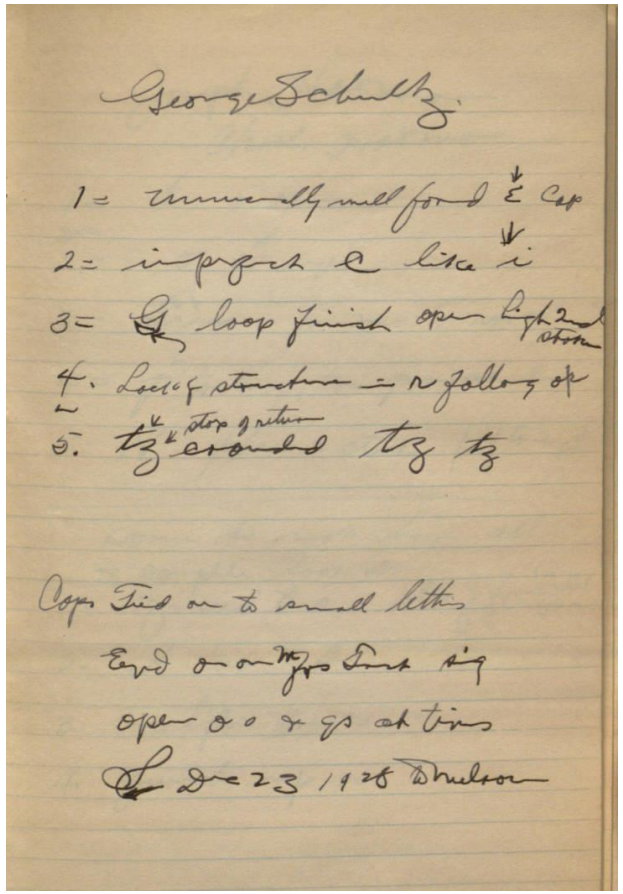
Arago Platinum Meter

Luminous Script Signs

https://www.nist.gov/digitalarchives

Special Collections on the NDA

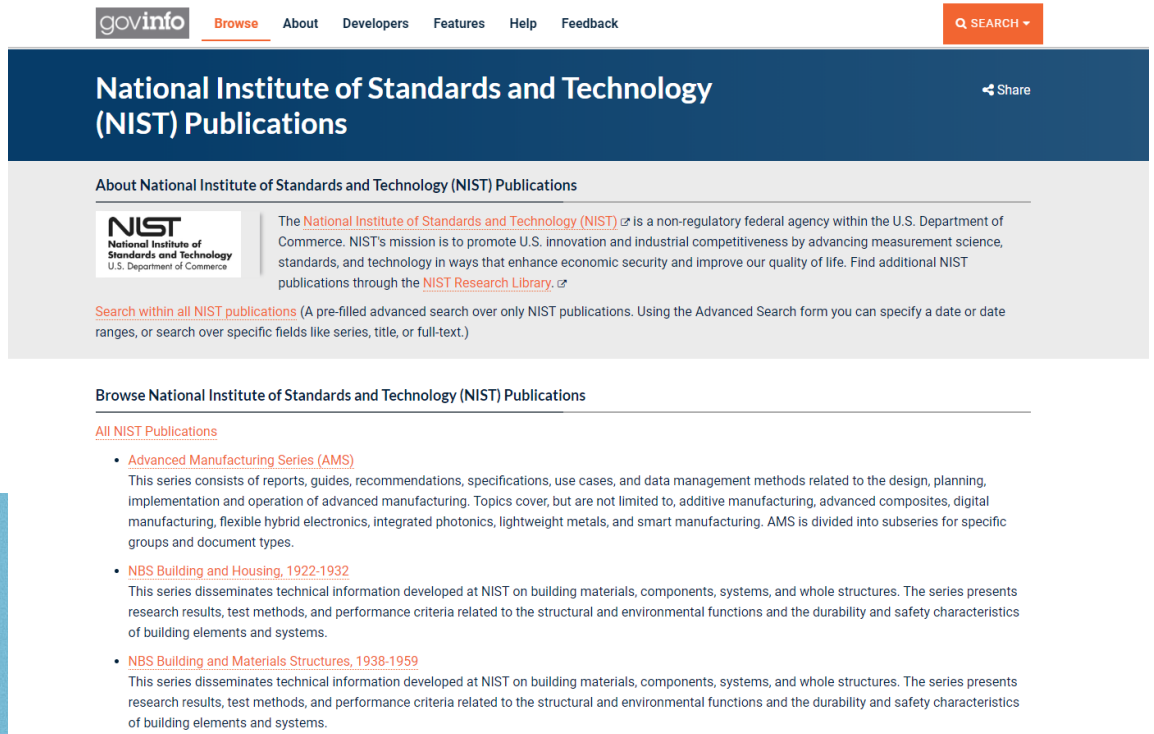
Silver Bridge Collapse



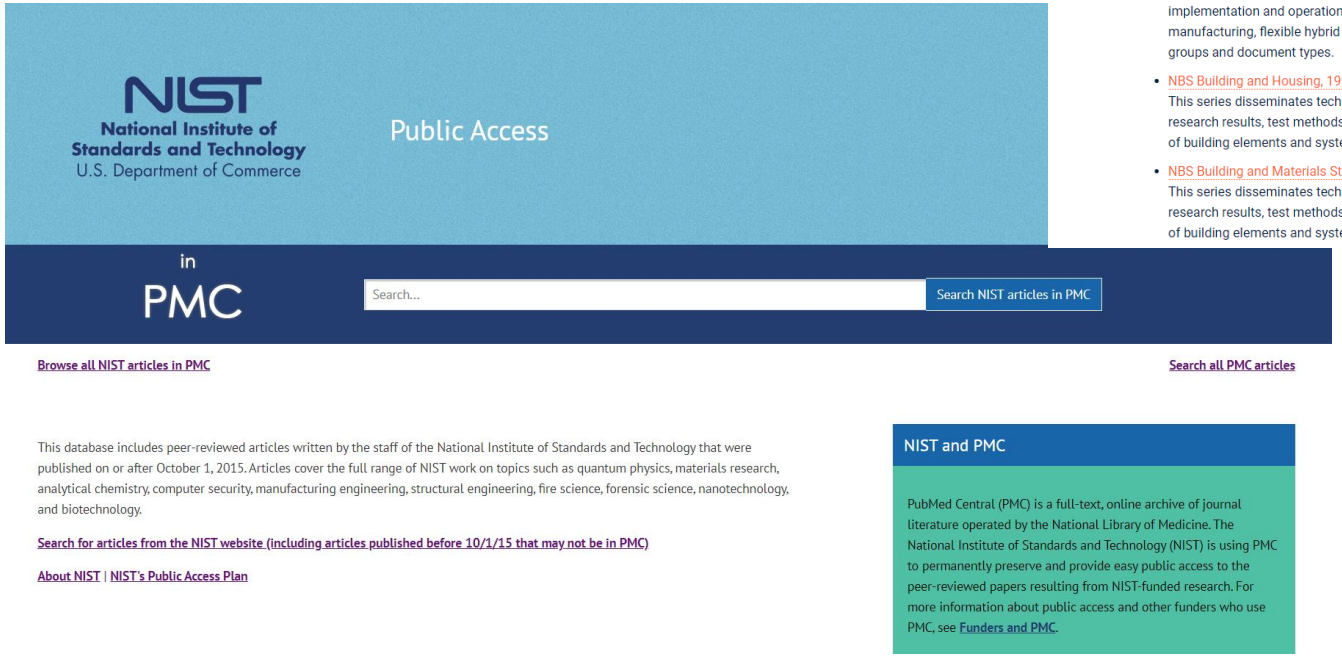
William Souder Notebooks

https://www.nist.gov/digitalarchives

NIST Publications in PMC and govinfo



https://www.govinfo.gov/collection/nist



https://www.ncbi.nlm.nih.gov/pmc/funder/nist/

Peer-Reviewed Publications in PMC

Volume 124, Article No. 124025 (2019) https://doi.org/10.6028/jres.124.025

Journal of Research of the National Institute of Standards and Technology

A Century of WWV

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Fort Collins, CO 80524, USA

glenn.nelson@nist.gov

WWV was established as a radio station on October 1, 1919, with the issuance of the call letters by the U.S. Department of Commerce. This paper will observe the upcoming 100th anniversary of that event by exploring the events leading to the founding of WWV, the various early experiments and broadcasts, its official debut as a service of the National Bureau of Standards, and its role in frequency and time dissemination over the past century.

Key words: broadcasting; frequency; radio; standards; time.

Accepted: September 6, 2019

Published: September 24, 2019

https://doi.org/10.6028/jres.124.025

1. Introduction

WWV is the high-frequency radio broadcast service that disseminates time and frequency information from the National Institute of Standards and Technology (NIST), part of the U.S. Department of Commerce. WWV has been performing this service since the early 1920s, and, in 2019, it is celebrating the 100th anniversary of the issuance of its call sign.

2. Radio Pioneers

Other radio transmissions predate WWV by decades. Guglielmo Marconi and others were conducting radio research in the late 1890s, and in 1901, Marconi claimed to have received a message sent across the Atlantic Ocean, the letter "S" in telegraphic code [1]. Radio was called "wireless telegraphy" in those days and was, if not commonplace, viewed as an emerging technology. However, these transmissions were usually not intended for a wide audience; in fact, in an attempt to establish a monopoly, for a time, the Marconi Company would not receive or retransmit messages that did not originate from Marconi-owned equipment [2]. The term "broadcasting" was not used to describe these point-to-point transmissions; it hearkens back to a farmhand sowing seed by flinging it by hand across the field, without regard for rows or furrows.

The U.S. Navy was one of the early adopters of this new technology, recognizing the tremendous advantage radio brought to communication: from land to ships and from ship to ship. Admiral George Dewey stated in 1904: "But from ships at sea, out of sight of flags or lights, and beyond the sound of guns, the electric wave, projected through space, invisible and inaudible, can alone convey the distant message" [2]. The Navy established a network of radio-transmitting facilities along both coasts of the United States and on numerous overseas bases during the first two decades of the twentieth century. Pertinent to this discussion, the Navy also established the first radio time service in the United States. One of their primary stations, with the call sign NAA, was built in 1912 across the Potomac from Washington, D.C., in Arlington, Virginia. The signal from the station, with its three distinctive towers, was often referred to as

How to cite this article:
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J Res Natl Inst Stan 124:124025. https://doi.org/10.6028/jres.124.025

NIST
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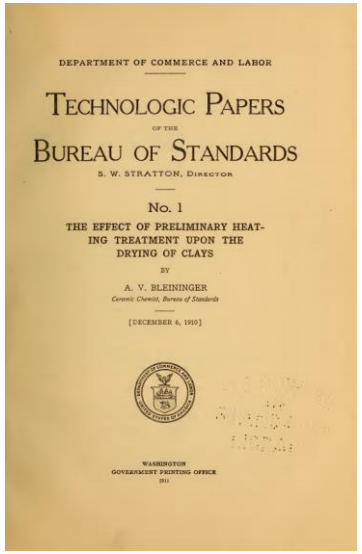
U.S. Department of Commerce
in
PMC



DEPARTMENT OF COMMERCE AND LABOR

TECHNOLOGIC PAPERS
OF THE
BUREAU OF STANDARDS
S. W. STRATTON, DIRECTOR

No. 1

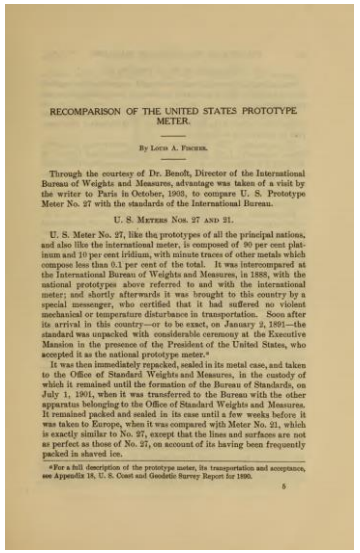
THE EFFECT OF PRELIMINARY HEATING TREATMENT UPON THE DRYING OF CLAYS

BY

A. V. BLEININGER
Ceramic Chemist, Bureau of Standards

[DECEMBER 6, 1910]

WASHINGTON
GOVERNMENT PRINTING OFFICE
1911



RECOMPARISON OF THE UNITED STATES PROTOTYPE METER.

By Louis A. Fischer.

Through the courtesy of Dr. Benoît, Director of the International Bureau of Weights and Measures, advantage was taken of a visit by the writer to Paris in October, 1903, to compare U. S. Prototype Meter No. 27 with the standards of the International Bureau.

U. S. Meters Nos. 27 and 21.

U. S. Meter No. 27, like the prototypes of all the principal nations, and also like the international meter, is composed of 90 per cent platinum and 10 per cent iridium, with minute traces of other metals which compose less than 0.1 per cent of the total. It was intercompared at the International Bureau of Weights and Measures, in 1888, with the national prototypes above referred to and with the international meter; and shortly afterwards it was brought to this country by a special messenger, who certified that it had suffered no violent mechanical or temperature disturbance in transportation. Soon after its arrival in this country—or to be exact, on January 2, 1891—the standard was unpacked with considerable ceremony at the Executive Mansion in the presence of the President of the United States, who accepted it as the national prototype meter.*

It was then immediately repacked, sealed in its metal case, and taken to the Office of Standard Weights and Measures, in the custody of which it remained until the formation of the Bureau of Standards, on July 1, 1901, when it was transferred to the Bureau with the other apparatus belonging to the Office of Standard Weights and Measures. It remained packed and sealed in its case until a few weeks before it was taken to Europe, when it was compared with Meter No. 21, which is exactly similar to No. 27, except that the lines and surfaces are not as perfect as those of No. 27, on account of its having been frequently packed in shaved ice.

*For a full description of the prototype meter, its transportation and acceptance, see Appendix 18, U. S. Coast and Geodetic Survey Report for 1890.

5

JOURNAL OF RESEARCH of the National Bureau of Standards
Vol. 84, No. 2, March–April 1979

A Novel Method for Analyzing Silver Sediment With High Precision

R. S. Davis and V. E. Bower

Center for Absolute Physical Quantities, National Bureau of Standards, Washington, DC 20234

October 25, 1978

A technique has been devised which is sufficiently accurate to aid in an electrochemical determination of the Faraday constant using the silver coulometer. The technique is used to recover the silver residue which falls from the anode during operation of the silver coulometer. In contrast to previous efforts at recovery, which involved weighing of the silver residue, the method here described is to convert the silver atoms to ions and then to plate the silver onto a cathode held at constant potential with respect to a reference electrode. The current involved in the electrolysis is integrated electronically. An overall standard deviation of 5 μg is achieved for samples ranging in size from 600 μg to 1.8 mg.

Key words: Controlled potential; coulometry; electrochemical equivalent of silver; electrochemistry; Faraday; potentiostat; silver; silver analysis.

I. Introduction

As a part of our effort to measure the electrochemical equivalent of silver and hence the Faraday constant [1],[1] we encountered a problem of determining the amount of finely-divided silver residue at the bottom of a beaker containing aqueous perchloric acid and silver perchlorate. The metallic silver could be expected to total from 100 μg to 2 mg. An acceptable uncertainty to the overall Faraday experiment dictated that the residue of metallic silver powder from a single Faraday run be recovered to an accuracy of 5 μg.

Briefly, the electrochemical equivalent of silver is found by passing a known amount of current through an electrolytic cell whose anode is a bar of silver. The reaction $Ag \rightarrow Ag^+ + e$ occurs at the anode. The loss in mass of the anode divided by the total charge passed determines the electrochemical equivalent. In practice, however, some of the anode is lost through the mechanical separation of small particles of silver. These fall to the bottom of the anode beaker, whose anolyte is a solution of dilute perchloric acid and silver perchlorate. The residue of metallic silver must be analyzed and an appropriate correction made.

In previous experiments to determine the electrochemical equivalent of silver [2], the anode residue was found by filtering it onto sintered glass and weighing. The weighing of a glass filter to an accuracy of 5 μg, however, seemed to us overly arduous if not completely futile.

Instead we performed the analysis of silver residue to the needed accuracy using a controlled-potential coulometric technique. The silver was first dissolved in nitric acid. Evaporation then left a deposit of silver nitrate. After dissolution in supporting electrolyte, the resulting silver ion was plated onto a platinum electrode held at constant potential. The time integral of the current passed during the analysis was measured electronically. Details of this procedure are provided below.

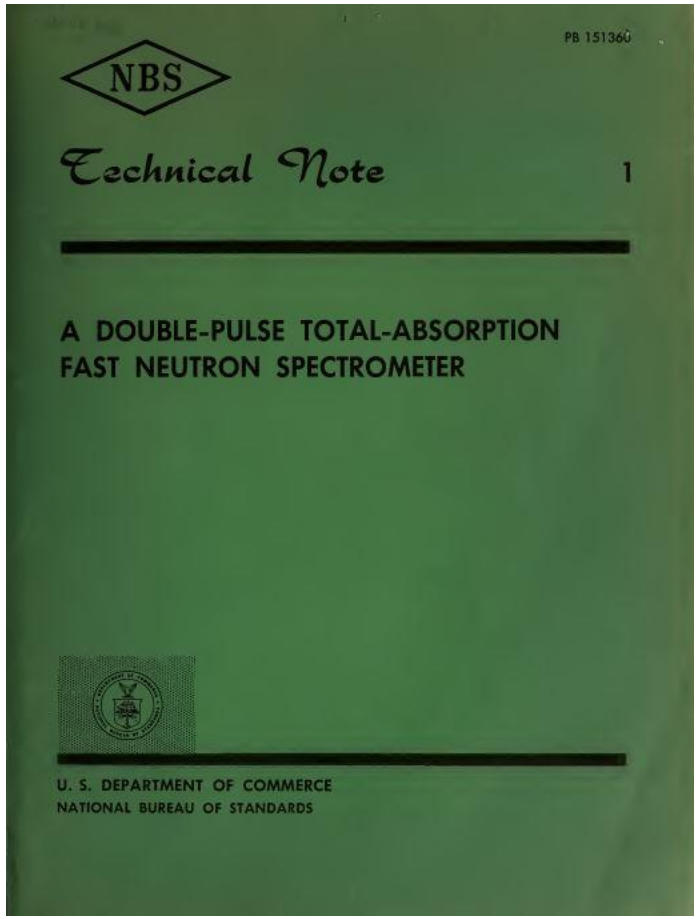
II. Apparatus

The three-electrode potentiostat built for this work follows the ideas first put forth by Booman [3]. In detailed design, our apparatus closely resembles that of Jones et al. [4]. The device is shown schematically in figure 1. All three operational amplifiers are solid-state and chopper-stabilized with a maximum output current of 25 mA. A limiting resistor (not shown) in the circuit assures that the maximum current will not exceed 9 mA. Amplifier 1 is provided with an overload recovery circuit (not shown) suggested by the manufacturer, which prevents it from saturating. Without this external circuit, it would take up to 3 s for the amplifier to recover from saturation, leading to an error of as much as 30 μg in the silver determination.

The integrating capacitor was 10 μf with polystyrene dielectric. The integrator was calibrated in coulombs by running the apparatus in a constant current mode: reference and anode leads were shorted and a calibrated resistor (R_i, in fig. 1) was placed between this junction and the cathode lead. In this way, a constant current of E_{bias}/R_i was produced by Amplifier 1 when the apparatus was turned on. The actual current was accurately known by reading the voltage across R_i with a high-impedance voltmeter. The length of time the current ran could be determined with sufficient accuracy

[1] Figures in brackets indicate literature references at the end of this paper.

NIST Technical Series Publications



- First published in 1902
- Comprised of 92 series
- Approximately 28,000 publications in total (24,000 digitized)
- Still publishing today
- Deposited into govinfo as preservation repository

https://doi.org/10.6028/NBS.TN.1

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National Institute of Standards and Technology (NIST) Publications

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About National Institute of Standards and Technology (NIST) Publications

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The National Institute of Standards and Technology (NIST) is a non-regulatory federal agency within the U.S. Department of Commerce. NIST's mission is to promote U.S. innovation and industrial competitiveness by advancing measurement science, standards, and technology in ways that enhance economic security and improve our quality of life. Find additional NIST publications through the NIST Research Library.

Search within all NIST publications (A pre-filled advanced search over only NIST publications. Using the Advanced Search form you can specify a date or date ranges, or search over specific fields like series, title, or full-text.)

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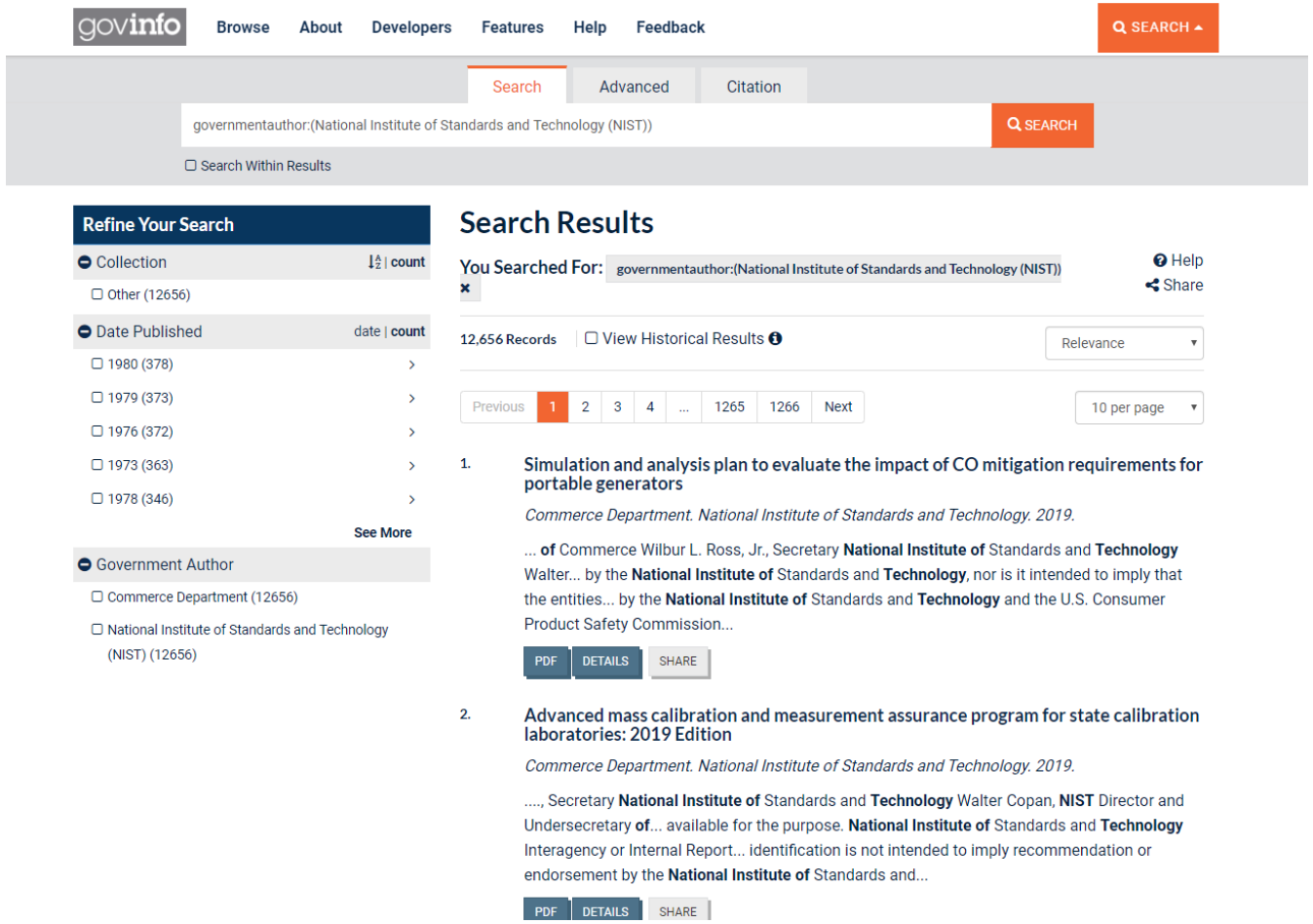
All NIST Publications

- Advanced Manufacturing Series (AMS)
  This series consists of reports, guides, recommendations, specifications, use cases, and data management methods related to the design, planning, implementation and operation of advanced manufacturing. Topics cover, but are not limited to, additive manufacturing, advanced composites, digital manufacturing, flexible hybrid electronics, integrated photonics, lightweight metals, and smart manufacturing. AMS is divided into subseries for specific groups and document types.
- NBS Building and Housing, 1922-1932
  This series disseminates technical information developed at NIST on building materials, components, systems, and whole structures. The series presents research results, test methods, and performance criteria related to the structural and environmental functions and the durability and safety characteristics of building elements and systems.
- NBS Building and Materials Structures, 1938-1959
  This series disseminates technical information developed at NIST on building materials, components, systems, and whole structures. The series presents research results, test methods, and performance criteria related to the structural and environmental functions and the durability and safety characteristics of building elements and systems.

https://www.govinfo.gov/collection/nist



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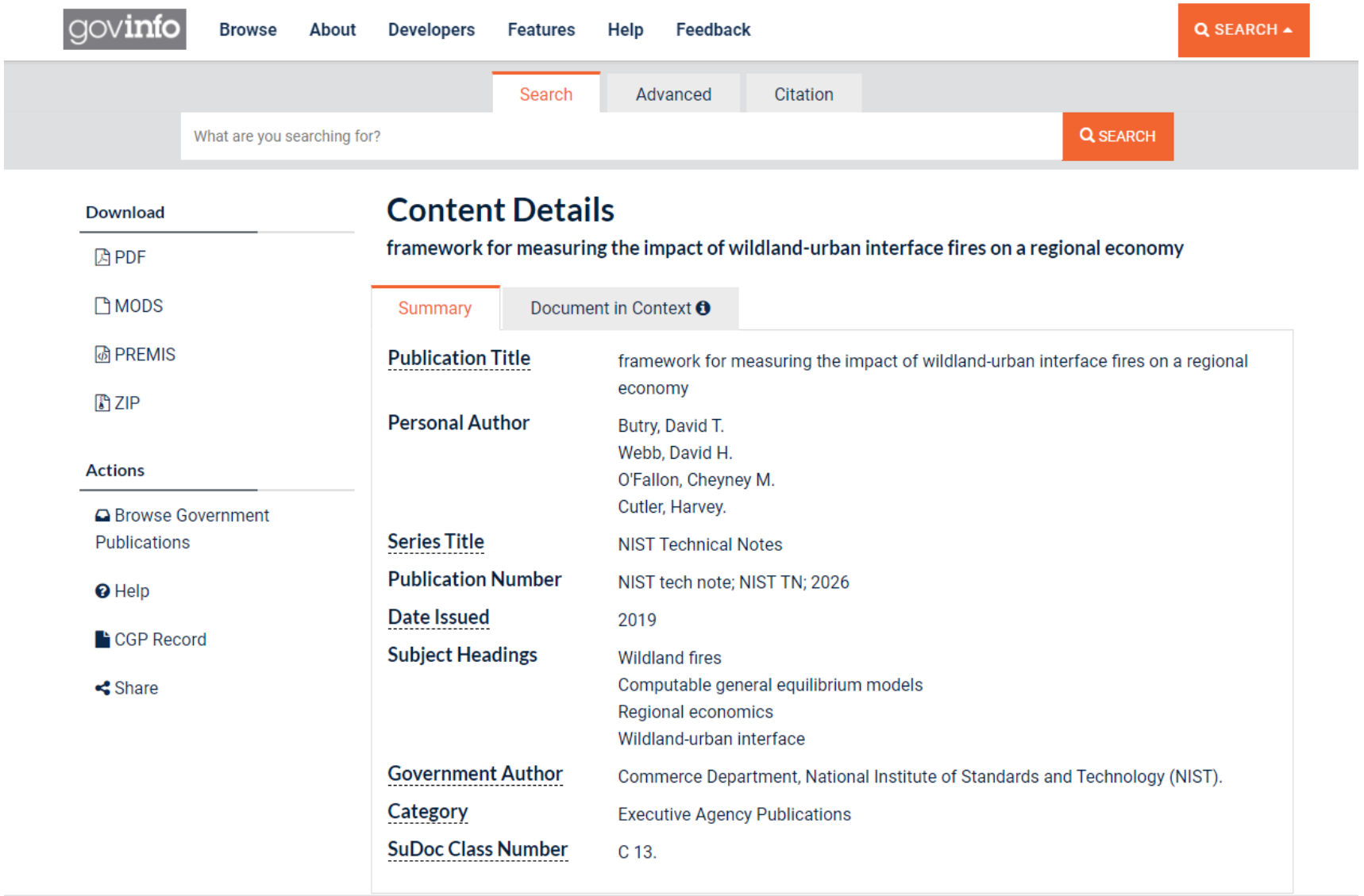

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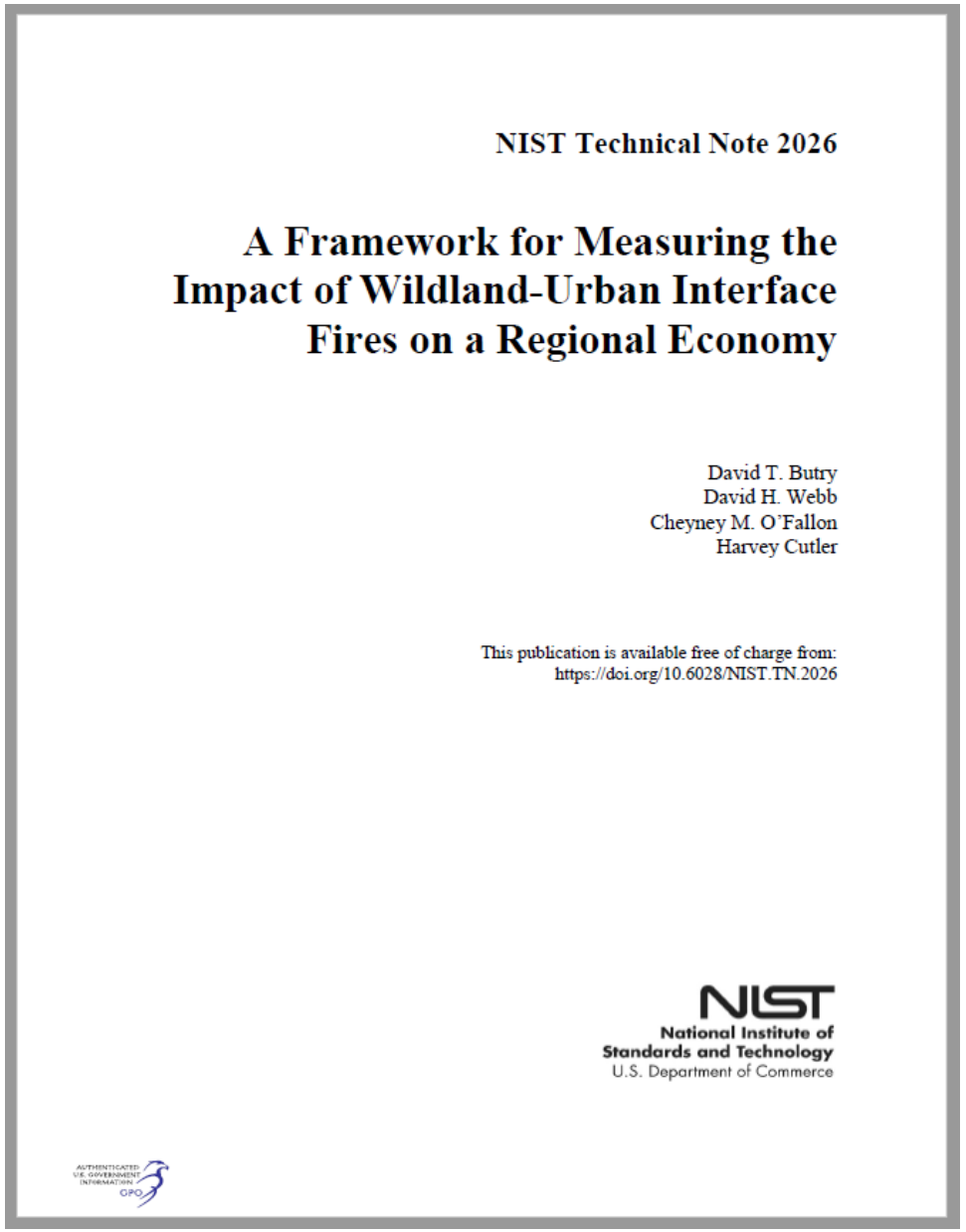

NIST Technical Note 2026

A Framework for Measuring the Impact of Wildland-Urban Interface Fires on a Regional Economy

David T. Butry
David H. Webb
Cheyney M. O'Fallon
Harvey Cutler

This publication is available free of charge from:
https://doi.org/10.6028/NIST.TN.2026

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National Institute of Standards and Technology
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https://www.govinfo.gov/collection/nist

Questions?

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